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NATIONAL DAM INSPECTION PROGRAM. BEAVER LAKE DAM (NDI-ID NUMBER--ETC(U)
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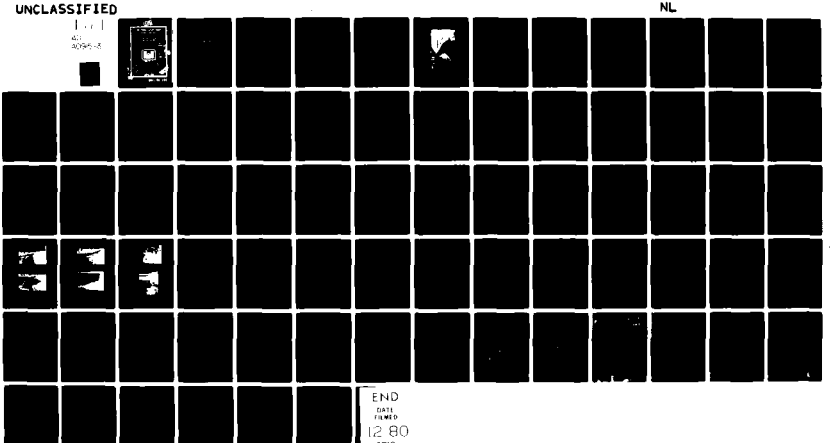

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PREFACE

This report has been prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITIONS AND RECOMMENDATIONS

Name of Dam: BEAVER LAKE DAM

State & State No.: PENNSYLVANIA, 64-180

County: WAYNE

Stream: TRIBUTARY TO DYBERRY CREEK

Date of Inspection: May 7, 1980

Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in good condition.

In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is significant. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of the 100-year flood to one-half of the probable maximum flood (PMF). The recommended SDF for this structure is the 100-year flood. The spillway and storage capacity is adequate for passing the SDF without overtopping the dam. Since the project can pass the SDF it is considered to be adequate.

The following recommendations are presented for immediate action by the owner:

1. That the openings of the principal and the emergency spillway be kept clear of any obstruction on the downstream and upstream side.

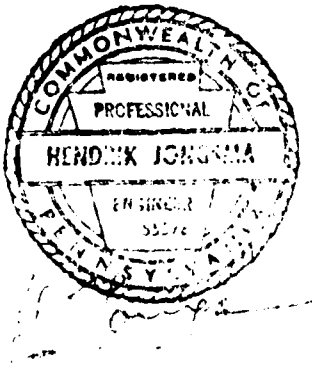
2. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

3. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

DATE: August 1, 1980



APPROVED BY:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer
DATE 30 August 1980

OVERVIEW

BEAVER LAKE DAM

Photograph No. 1

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BEAVER LAKE DAM

NDI-ID PA-00160
DER-ID 64-180

Delaware River Basin, Phase I Inspection Report

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspections of dams throughout the United States.

B. Purpose

The purpose of this inspection is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Note: Construction drawings indicate a normal pool at elevation 1500. Using a U.S.G.S. Quadrangle sheet Benchmark of 1644 on an adjacent highway, the inspection survey indicates a normal pool at elevation 1587.0. This surveyed elevation is referenced to the U.S.G.S. normal pool and is used in this report.

Beaver Lake Dam, formerly known as Carl Hoppl Dam, is a homogeneous earthfill structure, with a total length of about 850 feet. The maximum height of the embankment fill is 32 feet. The principal spillway, located near the center of the dam, is a 24-inch vertical drop inlet pipe discharging through an 18-inch diameter corrugated metal pipe at the downstream toe. An emergency spillway has been constructed near the left abutment. This spillway consists of four 30-inch diameter corrugated metal pipes placed under the fill. The invert of these pipes is about 1.5 feet above the normal pool elevation. The top of the embankment is five feet above normal pool elevation.

411003

B. Location: Lebanon Township, Wayne County
U.S.G.S. Quadrangle - Aldenville, Pa.
Latitude 41°-44.7', Longitude 75°-18.1'
Appendix E, Plates I & II

C. Size Classification: Small: Height - 32 feet
Storage - 261 acre-feet

D. Hazard Classification: Significant (Refer to Seciton 3.1.E.)

E. Ownership: Mr. Milton Van Horn
R.D. #1
Pleasant Mount, PA 18453

F. Purpose: Recreation, farm pond and fire protection

G. Design and Construction History

Construction drawings for Beaver Lake Dam were prepared by Mr. L.F. Burlein, P.E., Honesdale, Pennsylvania. These plans and an application for a construction permit were filed with the Department of Environmental Resources (PennDER) in May, 1962. In a letter to the owner of the property, Mr. Carl Hoppl, PennDER stated that the drainage area was less than half a square mile and that no existing downstream hazard existed. Therefore, no permit was required. Some suggested changes on the plans were made by the designer, who stated in a letter that the dam would be constructed in accordance to these plans. The dam was constructed in 1962 by Lester Soden & Sons, Honesdale, Pennsylvania. The inspection for this report indicates that during the construction, it was decided to replace the controlled drawdown outlet with an overflow pipe as the principal spillway and to construct an emergency spillway at the location of the intended spillway. A telephone conversation with the design engineer indicates that he was not involved with the construction supervision nor with the changes made to the plans.

H. Normal Operating Procedures

All inflow is discharged through the vertical standpipe until the pool level would reach the elevation of the invert of the emergency spillway.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

From files:	.5
Computed for this report:	.32
Use:	.32

B. Discharge at Dam Site (cubic feet per second)
See Appendix D for hydraulic calculations

Maximum known inflow (estimated from U.S.G.S. gage data for North Branch Calkins Creek at nearby Damascus, Pa.	107
Principal spillway at pool Elev. 1588.6 (emergency spillway invert)	19
Principal spillway at pool Elev. 1592.0 (low point of dam)	34
Emergency spillway capacity at pool Elev. 1592.0 (low point of dam)	139
Total spillway capacity at pool Elev. 1592.0	173

C. Elevation (feet above mean sea level)

Top of dam (surveyed low point)	1592.0
Emergency spillway invert	1588.6
Principal spillway crest	1587.0
Downstream outlet pipe invert	1559.4
Streambed at downstream toe of dam (estimate)	1560.0

D. Reservoir (miles)

Length of normal pool	.2
Length of maximum pool	.3

E. Storage (acre-feet)

Normal pool (Elev. 1587.0)	177
Top of dam (Elev. 1592.0)	261

F. Reservoir Surface (acres)

Top of dam (Elev. 1592.0)	18.1
Normal pool (Elev. 1587.0)	15.6

G. Dam

Refer to Plates III and IV in Appendix E for section, and Plate A-I, Appendix A, for plan.

Type: Homogeneous earthfill.

Length: 850 feet.

Height: 32 feet.

Top Width: Design - 18 feet; Survey - 15 feet.

Side Slopes:	Design	Surveyed
Upstream	3H to 1V	2.4H to 1V
Downstream	2H to 1V	1.9H to 1V

Zoning: None.

Cutoff: Five feet deep, eight feet wide trench excavated 35 feet upstream from centerline dam.

H. Outlet Facilities

None.

I. Spillway

Principal

Type: Drop inlet structure.

Inlet: Vertical 24" diameter pipe.

Outlet: 18" diameter CMP through embankment.

Crest Elevation: 1587.0

Location: Upstream toe near center of dam.

Emergency

Type: 4-barrel, 30-inch CMP culvert.

Location: Left abutment.

Crest Elevation: 1588.6.

J. Emergency Outlet

None.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The engineering design data for Beaver Lake Dam are limited to a set of design drawings prepared by Mr. L.F. Burlein. Visual inspection indicates that considerable changes were made during the construction, and the value of these drawings is questionable. The drainage area for this dam is less than 0.5 square mile, and at the time of construction, PennDER considered the dam a low hazard. For these reasons, and because the dam was located on private property, PennDER wrote the owner that no permit was required for the construction of this dam. This statement resulted in variations from the design drawings during the construction. There is no indication that test borings were made. Eight feet deep test pits excavated on the centerline dam indicate that loam, sand and gravel were overlaying a clay material at the five foot depth. Details of the characteristics of the embankment fill are unknown. Cross sections of the proposed reservoir indicate that the left bank of the reservoir was excavated and that this material was used for embankment fill. Hydrologic and hydraulic calculations by PennDER indicate that the drainage area was less than 0.5 square mile and that the designed spillway had a discharge capacity of 795 cfs with a freeboard of 0.5 foot.

2.2 CONSTRUCTION

Mr. Lester Soden, the contractor, stated in a telephone conversation that the embankment was constructed in accordance with the plans. The trench was excavated and backfilled with the borrow material from the left side of the reservoir. This material was a good clayey material and was compacted with a sheepsfoot roller. Mr. Soden, who has constructed many dams in the area, was on the job site daily.

2.3 OPERATION

Records of operation have not been maintained by the owner.

2.4 EVALUATION

A. Availability

The available engineering data, consisting of a set of design drawings, without "as built" conditions, are located in the files of PennDER at Harrisburg, Pennsylvania.

B. Adequacy

The available engineering data combined with the visual inspection are considered to be sufficiently adequate to make a reasonable assessment of the dam.

C. Operating Records

Operating records, including maximum pool levels, have not been maintained by the owner.

D. Post Construction Changes

The visual inspection does not indicate that post construction changes have been made. However, the dam and appurtenant structures were not constructed in accordance to the design drawings.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of Beaver Lake Dam is good. The embankment slopes are presently free of high weeds and shrubs. The wet areas noticed during the inspection are located twenty to one hundred feet beyond the downstream toe of the dam. There are two spillways. The principal spillway consists of a 24-inch diameter vertical standpipe which discharges all normal inflow at the downstream toe through an 18-inch pipe located under the embankment. If the pool level would rise more than 1.6 feet, the emergency spillway near the left abutment would be activated.

The visual inspection check list and sketches of the general plan and profile of the dam, as surveyed during the inspection, are presented in Appendix A of this report.

Photographs taken on the day of inspection are reproduced in Appendix C.

B. Embankment

The upstream slope has a good grass cover. The reservoir is small; and although no riprap protection was used, there were no signs of damage caused by wave action. The top of the dam consists of an unpaved dirt road. The surface is hard and only a few depressions were noticed near the right abutment. The surveyed profile (Appendix A, Plate A-II) indicates that the dam profile is situated in a vertical sag with the lowest point five feet above normal pool elevation. The downstream slope of the embankment is very regular and has a dense field grass cover except near the right abutment where some light weeds are growing. The embankment slope is dry and there are no signs of sloughage or other stability problems. The area downstream of the toe is flat and several swampy areas were noticed (Plate A-I, Appendix A). This condition is attributed to surface drainage problems of the surrounding area.

C. Appurtenant Structures

The normal inflow is discharged through a 24-inch standpipe, measured to be about 26 feet high and located 23 feet upstream from the dam crest (Photograph No. 5, Appendix C). At the downstream toe, the water discharges through an 18-inch pipe in a small natural swale. A concrete headwall and some riprap protects the embankment (Photographs No. 6 & 7, Appendix C). There is an emergency spillway consisting of four corrugated metal pipes placed under the embankment fill near the

left abutment. The approach to and the area beyond the pipes is flat (see Appendix D). Some high weeds at the upstream and downstream openings of the pipes could reduce the effectiveness of the emergency spillway.

D. Reservoir Area

The reservoir is surrounded by some light wooded lands and some cultivated lands. The slopes are flat and stable. Siltation is not expected to cause a problem.

E. Downstream Channel

The immediate downstream channel consists of a shallow narrow swale which discharges in a small pond. The slope in the channel is flat. Another pond with a small dam is located about one mile downstream. Immediately downstream of this second pond is State Highway Route 371. A pond owned by the Pennsylvania Fish Commission is located south of the Highway. There is a potential hazard to loss of life of one or two transient people on highway and in maintenance building downstream if the dam fails. The hazard category for Beaver Lake Dam is considered to be "Significant."

3.2 EVALUATION

The overall visual evaluation of the facilities indicates that the dam is in good condition. It is recommended to keep the openings of the spillway pipes clear of debris and brush.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Beaver Lake Dam and reservoir were constructed as an enhancement of the area, for fire protection, and to serve as a farm pond. Operational procedures do not exist and all inflow above normal pool level is permitted to flow through the principal spillway or through the emergency spillway if the pool reaches a level 1.6 feet above the normal pool elevation.

4.2 MAINTENANCE OF DAM

The embankment slopes are covered with a dense field grass and appear well maintained. The top of the dam is the access road to the owner's house and farm building and has a good hard surface.

4.3 MAINTENANCE OF OPERATING FACILITIES

There are no operating facilities at this dam except the uncontrolled spillways. The emergency spillway should be kept clear of any obstructions.

4.4 WARNING SYSTEM

There is no formally organized surveillance and downstream warning system in existence at the present time.

4.5 EVALUATION

The operational procedures for Beaver Lake Dam are minimal at the present time. Although the dam is in good condition, operational procedures should include the clearing of the emergency spillway openings at regular intervals. A formal surveillance and downstream warning system should be developed for implementation during periods of high or prolonged rainfall.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

The hydrologic and hydraulic analysis available from PennDER for Beaver Lake Dam is limited. The files contained no stage-discharge curve, stage-storage curve, design flood hydrograph or flood routings. The files do contain copies of computations by PennDER for spillway capacity. These computations indicate that the designed spillway had a capacity of 795 cfs with 0.5 foot of freeboard.

Design drawings contained in the PennDER files indicate that the spillway was a 32' long ogee weir. These drawings also indicate that the drawdown facilities consisted of a concrete encased 18-inch CMP through the embankment with closure at the upstream side by an 18-inch slide gate. However, these features were not constructed.

B. Experience Data

There are no records of flood levels at Beaver Lake Dam. Based on records of the U.S.G.S. stream gage on North Calkins Creek at nearby Damascus, Pa., the maximum inflow to Beaver Lake is estimated to be 107 cfs.

C. Visual Observations

It was noted that the appurtenant structures of the dam were not built in accordance with the design drawings. The drawdown facilities have been replaced by the principal spillway inlet pipe. The ogee weir has been eliminated and in its place is a 30-inch CMP four barrel culvert. These changes have eliminated the drawdown capacity and considerably reduced the discharge capacity. Neither spillway had protection from possible obstruction by debris. The emergency spillway culvert had considerable weed growth both upstream and downstream of the pipes. No other conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event.

D. Overtopping Potential

Beaver Lake Dam has a total storage capacity of 261 acre-feet and the overall height is 32 feet above the streambed. These dimensions indicate a size classification of "Small." The hazard classification for this dam is "Significant" (see Section 3.1.E.).

The Spillway Design Flood (SDF) for a dam having the above classification should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). Since the downstream area is not populated, the recommended SDF for this dam is the 100 year flood. For this dam the SDF peak inflow is 269 cfs (See Appendix D for hydraulic calculations).

Comparison of the estimated SDF peak inflow of 269 cfs with the estimated total discharge capacity of 173 cfs indicates that a potential for overtopping of the Beaver Lake Dam exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam has the necessary storage available to pass the SDF without overtopping.

E. Spillway Adequacy

The small size and signficant hazard categories, in accordance with the Corps of Engineers' criteria and guidelines, indicates that the SDF for this dam should be in the range of the 100 year flood to one-half the PMF. The recommended SDF is the 100 year flood.

Calculations show that the total spillway discharge capacity and reservoir storage capacity, based on the present low point of the dam profile, combine to handle the SDF without overtopping the dam (Refer to Appendix D).

Since the total spillway discharge and reservoir storage capacity can pass the SDF without overtopping, the spillway is considered to be adequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of Beaver Lake Dam did not detect any signs of embankment instability. The field survey indicates that the slopes are steeper than the proposed slopes on the design drawings. The slopes, however, are considered to be adequate for the height of the dam under consideration. The profile of the dam indicates that the crest is fairly level, with a low point near its center.

2. Appurtenant Structures

The principal spillway is a 24-inch diameter standpipe. The opening is unprotected. The emergency spillway consists of four parallel 30-inch diameter pipes. Protection at the entrance and exit has not been provided. The approaches to the pipe at the downstream and upstream side are, however, wide and flat and scour is not expected to be a problem.

B. Design and Construction Data

1. Embankment

Construction did not follow the original design drawings. The contractor confirmed, however, that a cutoff trench was excavated to suitable material and that the embankment material consists of a good clayey material. The material was placed in layers and compacted.

2. Appurtenant Structures

The contractor has indicated that three anti-seepage collars were installed on the 18-inch diameter pipe under the embankment. Without adequate anchorage, the standpipe could be damaged. Except for the lowering of the reservoir, this would not cause a serious problem. The emergency spillway has a good grass covered approach and discharge channel.

C. Operating Records

Operating records for this dam have not been maintained by the owner. There are no indications that problems were encountered.

D. Post Construction Changes

There are no records of changes to the embankment or its appurtenant structures.

E. Seismic Stability

This dam is located in Seismic Zone 1 and it is considered that the static stability is sufficient to withstand minor earthquake-induced dynamic forces. No studies or calculations have been made to confirm this assumption.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection and the review of the construction drawings indicate that Beaver Lake Dam is in good condition and has been constructed in accordance with acceptable engineering practices. The field inspection did not detect any signs of instability. The wet areas beyond the downstream toe are not considered to be serious at the present time.

The hydrologic and hydraulic computations indicate that the combination of storage capacity and the spillway discharge capacity are able to pass the SDF without overtopping the dam, and that the spillway is adequate.

B. Adequacy of Information

The design information contained in the files combined with the visual inspection are considered sufficiently adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations presented below should be implemented immediately.

D. Additional Studies

Additional studies are not required at this time.

7.2 RECOMMENDATIONS

In order to assure the continued satisfactory operation of this dam, the following recommendations are presented for immediate implementation by the owner:

1. That the openings of the principal spillway and the emergency spillway be kept clear of any obstruction on the downstream and upstream side.

2. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

3. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures.

APPENDIX A

CHECKLIST OF VISUAL INSPECTION REPORT

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 64-180 NDI NO. PA-00160

NAME OF DAM BEAVER LAKE DAM HAZARD CATEGORY Significant

TYPE OF DAM Earthfill embankment

LOCATION Lebanon TOWNSHIP Wayne COUNTY, PENNSYLVANIA

INSPECTION DATE 5/7/80 WEATHER Sunny TEMPERATURE 50's

INSPECTORS: R. Houseal (Recorder) OWNER'S REPRESENTATIVE(s):

H. Jongsma Milton Van Horn

R. Shireman

A. Bartlett

NORMAL POOL ELEVATION: 1587.0 AT TIME OF INSPECTION:

BREAST ELEVATION: 1592.0 Low Point Surveyed POOL ELEVATION: 1587

SPILLWAY ELEVATION: 1588.6 (Emergency) TAILWATER ELEVATION:

MAXIMUM RECORDED POOL ELEVATION: Unknown

GENERAL COMMENTS:

NDI NO. PA-00 160

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None observed.
B. UNUSUAL MOVEMENT BEYOND TOE	None observed.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	None observed.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	Horizontal - Tangent alignment - good. Vertical - Refer to profile Plate A-II.
E. RIPRAP FAILURES	No riprap on slopes.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Abutments with natural ground are good.
G. SEEPAGE	None detected. There are some marshy areas 20' to 100' downstream from the toe of the embankment.
H. DRAINS	None detected.
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Upstream and downstream slopes are covered with grass and very light weeds. Crest of dam is a dirt roadway - good condition.

NDI NO. PA-00160

VISUAL INSPECTION
OUTLET WORKS

	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	Vertical pipe 23 feet upstream from upstream embankment slope.
B. OUTLET STRUCTURE	18-inch horizontal pipe - extension from vertical intake, discharging into swale at toe of downstream slope. Outlet pipe has a concrete headwall.
C. OUTLET CHANNEL	Small field swale leading to a downstream pond.
D. GATES	None.
E. EMERGENCY GATE	None.
F. OPERATION & CONTROL	None.
G. BRIDGE (ACCESS)	None.

NDI NO. PA-00160

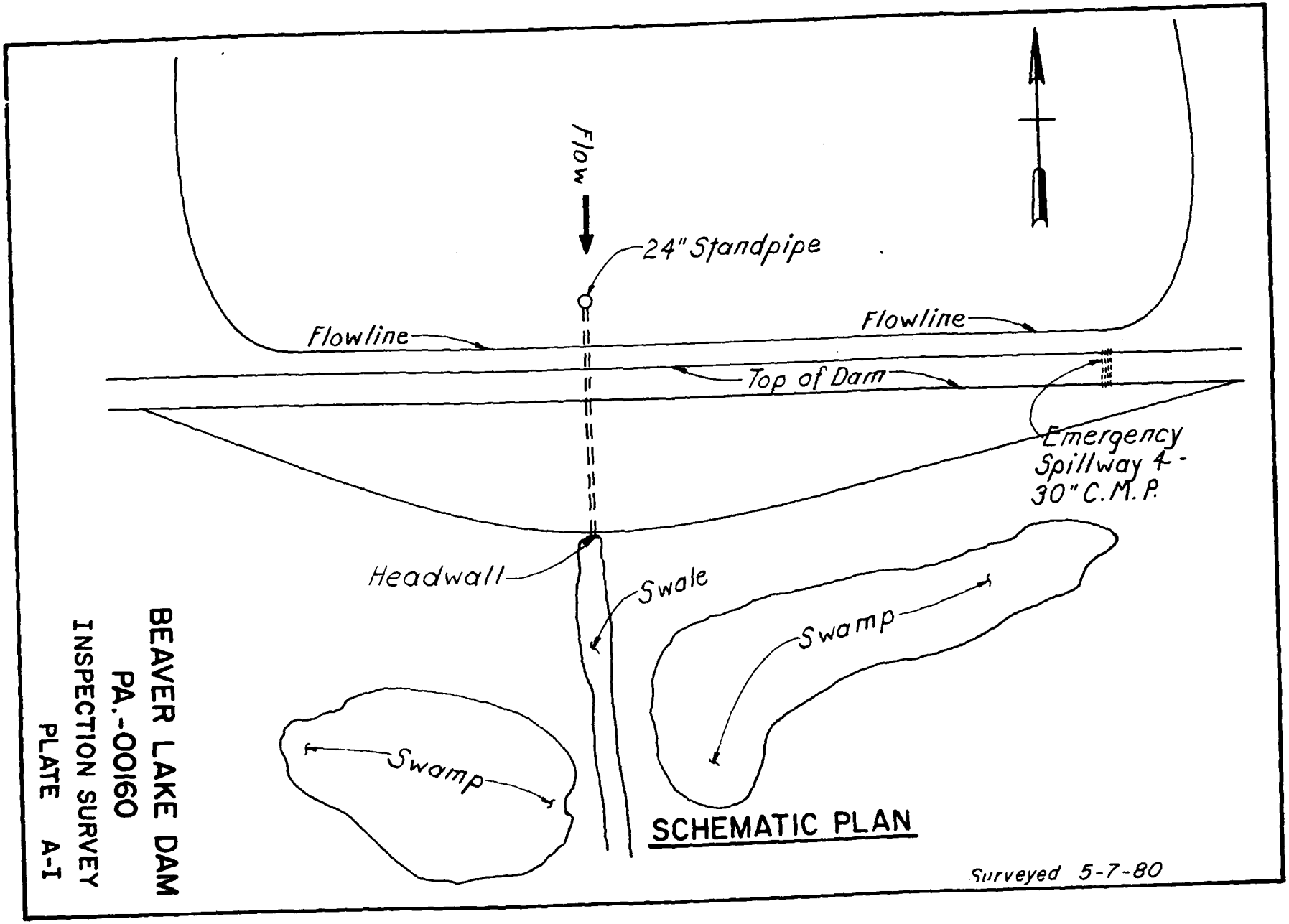
VISUAL INSPECTION
SPILLWAY
EMERGENCY

	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	Approach to drop inlet pipe is directly from reservoir surface. Near left abutment are four 30-inch C.M.P. under roadway which will discharge to downstream area.
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Approach at outlet of 30-inch pipe has grassed surface. See Plate A-III for elevations of each pipe.
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	Flat slopes, grassed surface.
D. BRIDGE & PIERS	None.
E. GATES & OPERATION EQUIPMENT	None.
F. CONTROL & HISTORY	None.

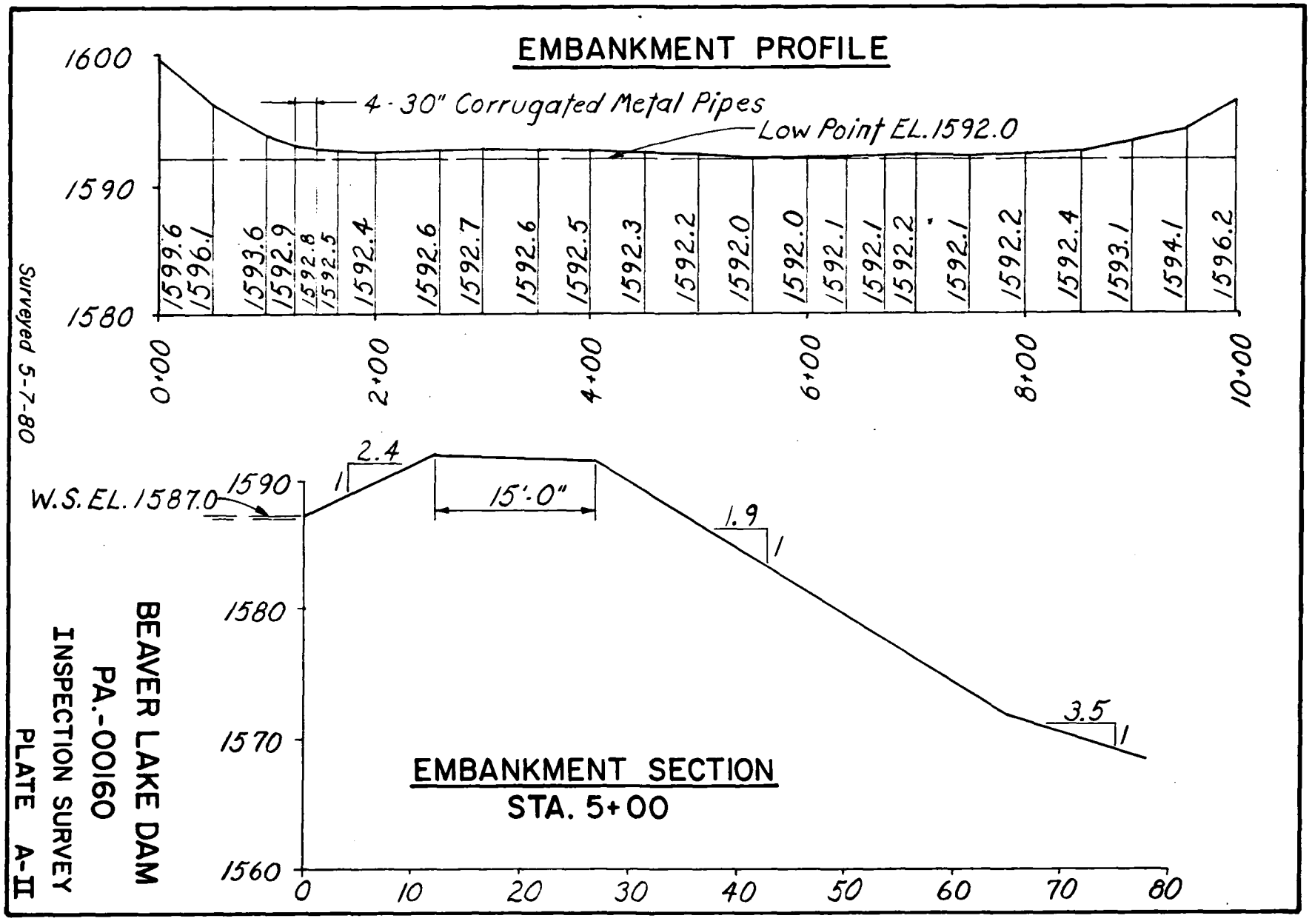
NDI NO. PA-00160

VISUAL INSPECTION

	OBSERVATIONS AND REMARKS
INSTRUMENTATION Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	None.
RESERVOIR Slopes	Lightly wooded and grass.
Sedimentation	None reported.
Watershed Description	60 percent cultivated, 40 percent woodland.
DOWNSTREAM CHANNEL Condition	Field swale in good condition.
Slopes	Flat.
Approximate Population	Varies.
No. Homes	Two ponds and State Highway Route 371. One pond is owned by Pa. Fish Commission with a storage shed close to water's edge.



BEAVER LAKE DAM
PA.-00160
INSPECTION SURVEY
PLATE A-I


EMBANKMENT PROFILE
1600
1590
1580
4 - 30" Corrugated Metal Pipes
Low Point EL. 1592.0
1599.6
1596.1
1593.6
1592.9
1592.8
1592.5
1592.4
1592.6
1592.7
1592.6
1592.5
1592.3
1592.2
1592.0
1592.0
1592.1
1592.1
1592.2
1592.1
1592.2
1592.4
1593.1
1594.1
1596.2
0+00
2+00
4+00
6+00
8+00
10+00
Surveyed 5-7-80
2.4
1
W.S. EL. 1587.0
1590
15'-0"
1.9
1
1580
1570
1560
3.5
1
EMBANKMENT SECTION
STA. 5+00
0
10
20
30
40
50
60
70
80
BEAVER LAKE DAM
PA.-00160
INSPECTION SURVEY
PLATE A-II

EMERGENCY SPILLWAY

PIPES 1 THROUGH 4, LEFT TO RIGHT

Pipe No.	Inlet Elevation	Outlet Elevation
1	1588.6	1588.6
2	1588.6	1588.4
3	1588.5	1588.3
4	1588.6	1588.2

BEAVER LAKE DAM
PA-00160
INSPECTION SURVEY
PLATE A-III

SURVEYED 5-7-80

APPENDIX B

CHECKLIST OF ENGINEERING DATA

CHECK LIST
ENGINEERING DATA

PA DER # 64-180 NDI NO. PA-00 160

NAME OF DAM BEAVER LAKE DAM

ITEM	REMARKS
AS-BUILT DRAWINGS	Not available. The design drawings were not followed during construction. The spillway was replaced by four pipes.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle - Aldenville, Pa. See Plate II, Appendix E
CONSTRUCTION HISTORY	Constructed in 1962 by Lester Soden & Sons. Contractor, Honesdale, Pa. No records.
GENERAL PLAN OF DAM	In files of PennDER.
TYPICAL SECTIONS OF DAM	Plate III, Appendix E.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	A 24-inch standpipe was connected to the 18-inch outlet pipe shown on Plate IV, Appendix E. Sliding gate was not installed. No ratings available.

NDI NO. PA-00 160

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	No records.
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	Test pits on centerline. Results in PennDER files.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Left side, immediately upstream of dam.

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	During construction.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None.
MAINTENANCE & OPERATION RECORDS	None.
SPILLWAY PLAN, SECTIONS AND DETAILS	Plate V, Appendix E. This was not built. Emergency spillway consists of four 30-inch CMP.

NDI NO. PA-00160

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	None.
CONSTRUCTION RECORDS	None.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	None.
MISCELLANEOUS	

NDI NO. PA-00 160

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Flat slopes, 60% culvitaved, 40% woodland

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 1587 Acre-Feet 177

TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 1592 Acre-Feet 261

MAXIMUM DESIGN POOL: Elev. 1592

TOP DAM: Elev. 1592

SPILLWAY:	PRINCIPAL	EMERGENCY
a. Elevation	1587	1588.6
b. Type	drop inlet structure	4 barrel CMP culvert
c. Width	24" diameter pipe	each barrel 30" dia.
d. Length	---	---
e. Location Spillover	upstream toe near center of dam	left abutment
f. Number and Type of Gates	none	none

OUTLET WORKS:

a. Type none

b. Location

c. Entrance inverts

d. Exit inverts

e. Emergency drawdown facilities none

HYDROMETEOROLOGICAL GAGES:

a. Type none

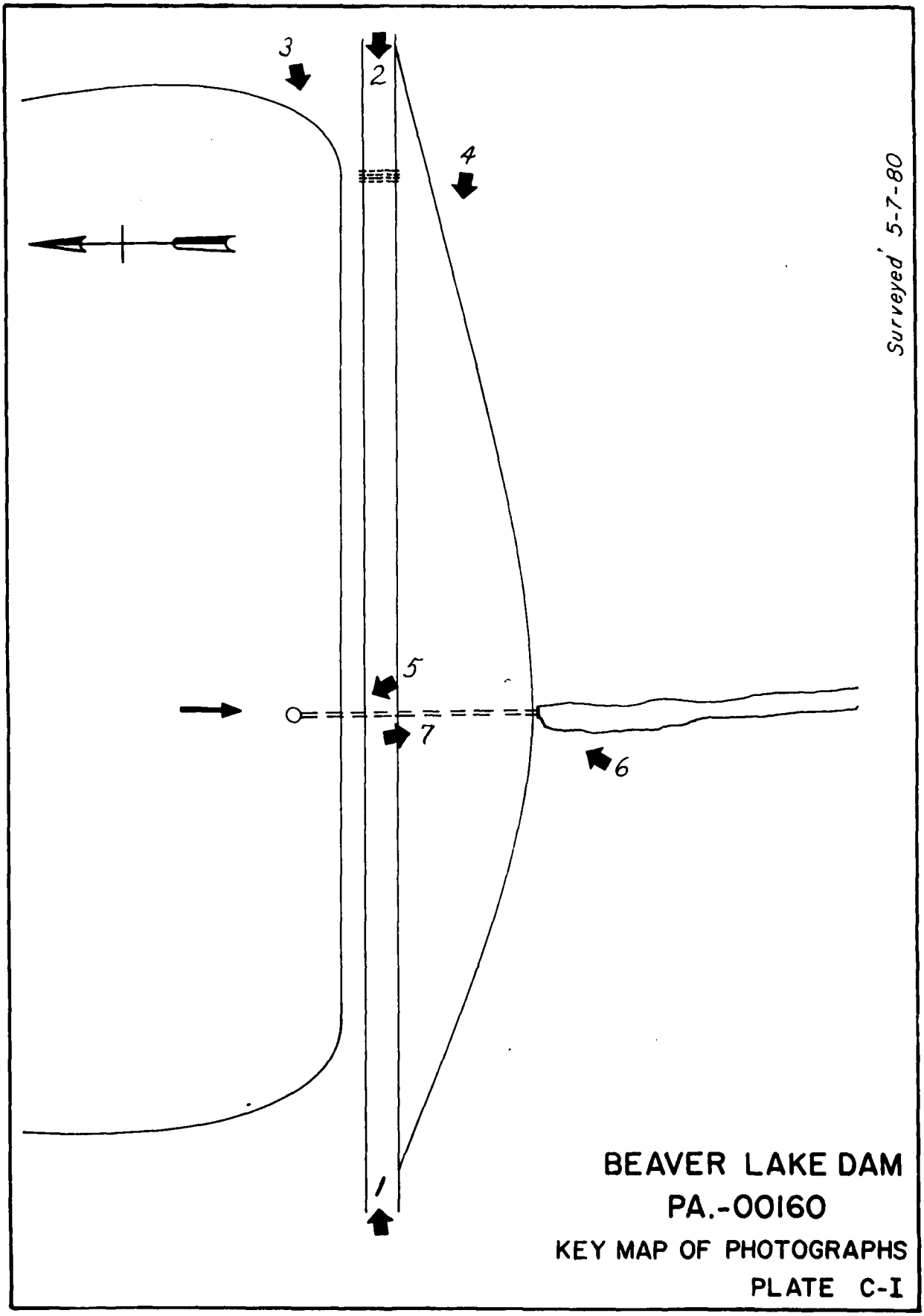
b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 173 cfs

APPENDIX C

PHOTOGRAPHS

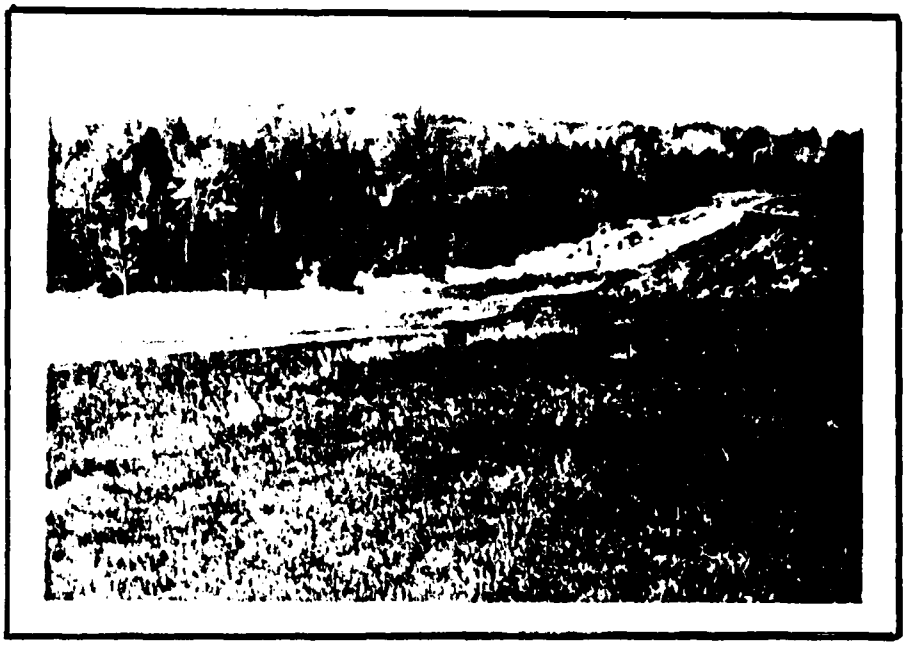


BEAVER LAKE DAM
PA.-00160
KEY MAP OF PHOTOGRAPHS
PLATE C-I

OVERVIEW FROM LEFT ABUTMENT - NO. 2

UPSTREAM SLOPE - NO. 3

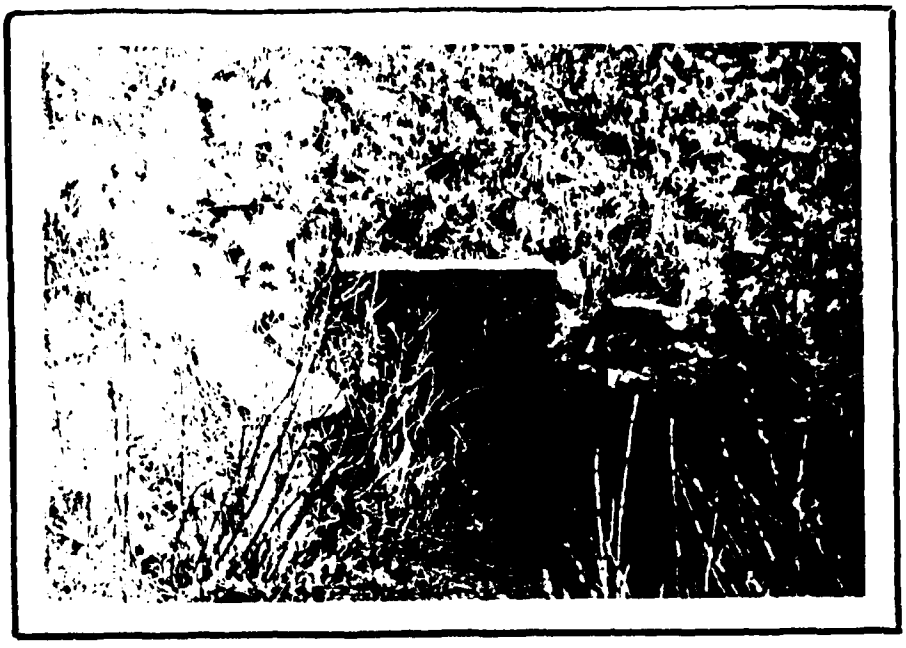
PA-00160
Plate C-II



DOWNSTREAM SLOPE - NO. 4

PRINCIPAL SPILLWAY INLET - NO. 5

PA-00160
Plate C-III



18-INCH OUTLET PIPE & HEADWALL - NO. 6

DOWNSTREAM SWALE OF OUTLET PIPE - NO. 7

PA-00160
Plate C-IV

APPENDIX D

HYDROLOGY AND HYDRAULIC CALCULATIONS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

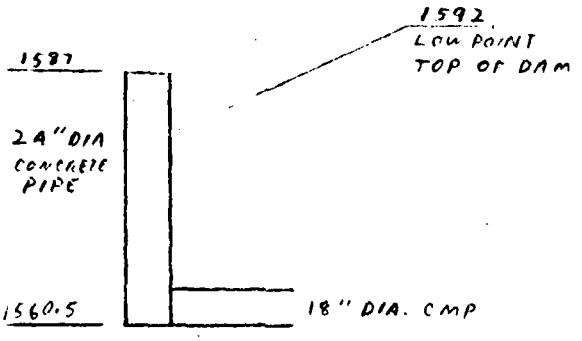
For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.

BY RLS DATE 6/12/80 **BERGER ASSOCIATES** SHEET NO. 1 OF
CHKD. BY DATE PROJECT D9650
SUBJECT BLAKLA LAKE

PRINCIPAL SPILLWAY RATING

DROP INLET PIPE 24" DIA. C = 0.6

CREST ELEVATION: 1587



$Q = CA\sqrt{2gH}$

$H = 1592 - 1587 = 5'$

$Q = 0.6 \times \pi \times \frac{(2)^2}{4} \times (2 \times 32.2 \times 5)^{0.5}$

$= 34$ CFS

CHECK 18" ORIFICE

$H = 1587 - 1561.25 = 25.75'$

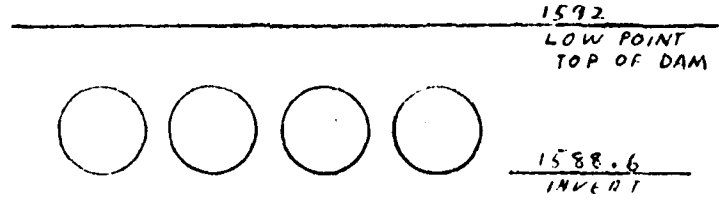
$Q = 0.6 \times \pi \times \frac{(1.5)^2}{4} \times (2 \times 32.2 \times 25.75)^{0.5}$

$= 43$ CFS

$43 > 34 \therefore$ 2" ORIFICE CONTROLS

BY ... DATE 6/13/80 **BERGER ASSOCIATES** SHEET NO. 2 OF
CHKD. BY ... DATE PROJECT D9650
SUBJECT BEAVER LAKE

EMERGENCY SPILLWAY RATING



4 - 30" CMP's

$C = 0.6$

$Q = CA\sqrt{2gH}$

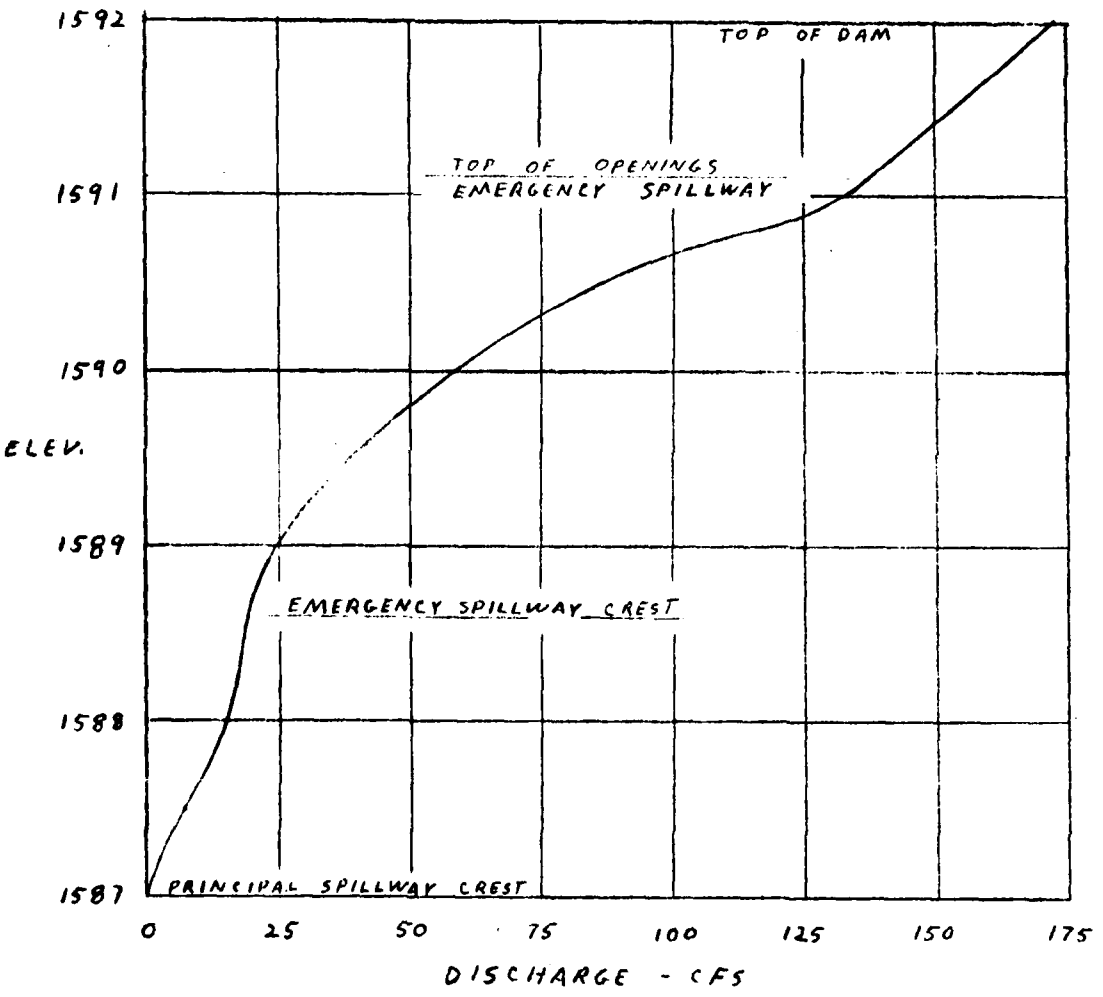
$H = 1592 - 1589.85 = 2.15'$

$Q = 4 \times 0.6 \times \pi \times \frac{(2.5)^2}{4} \times (2 \times 32.2 \times 2.15)^{0.5}$

$= 139$ cfs

BY RLS DATE 6/16/80 **BERGER ASSOCIATES** SHEET NO. 3 OF 1
CHKD. BY DATE PROJECT D9650
SUBJECT BEAVER LAKE

DISCHARGE RATING CURVE



BY RLS DATE 6/16/8[illegible] **BERGER ASSOCIATES** SHEET NO. 1 OF 1
CHKD. BY DATE PROJECT D965[illegible]
SUBJECT BEAVER LAKE

EMBANKMENT RATING

$Q = C\ L\ H^{3/2}$ $C = 2.7$

AT ELEV 1592.5

$2.7 \times 50 \times (.5)^{1.5}$	= 48	
$2.7 \times 50 \times (.4)^{1.5}$	= 34	
$2.7 \times 50 \times (.25)^{1.5}$	= 17	
$2.7 \times 50 \times (.1)^{1.5}$	= 9	
$2.7 \times 60 \times (.05)^{1.5}$	= 2	
$2.7 \times 35 \times (.45)^{1.5}$	= 29	
$2.7 \times 35 \times (.4)^{1.5}$	= 24	
$2.7 \times 130 \times (.35)^{1.5}$	= 73	
$2.7 \times 50 \times (.2)^{1.5}$	= 12	
$2.7 \times 7 \times (.05)^{1.5}$	= -	Σ = 243 CFS

AT ELEV 1593

$2.7 \times 50 \times (1)^{1.5}$	= 135	
$2.7 \times 46 \times (.9)^{1.5}$	= 115	
$2.7 \times 50 \times (.75)^{1.5}$	= 77	
$2.7 \times 50 \times (.6)^{1.5}$	= 63	
$2.7 \times 50 \times (.45)^{1.5}$	= 41	
$2.7 \times 100 \times (.35)^{1.5}$	= 56	
$2.7 \times 50 \times (.5)^{1.5}$	= 48	
$2.7 \times 35 \times (.55)^{1.5}$	= 39	
$2.7 \times 22 \times (.4)^{1.5}$	= 15	
$2.7 \times 14 \times (.2)^{1.5}$	= 3	
$2.7 \times 9 \times (.05)^{1.5}$	= -	
$2.7 \times 35 \times (.9)^{1.5}$	= 81	
$2.7 \times 130 \times (.85)^{1.5}$	= 275	
$2.7 \times 50 \times (.7)^{1.5}$	= 79	
$2.7 \times 43 \times (.3)^{1.5}$	= 19	Σ = 1057 CFS

AT ELEV 1593.5 Σ = 2391 CFS

BY RLS DATE 7/28/80 **BERGER ASSOCIATES** SHEET NO. 5 OF 6
CHKD. BY DATE PROJECT D7650
SUBJECT BEAVER LAKE

DISCHARGE SUMMARY

ELEV.	PRINCIPAL SPILLWAY Q (CFS)	EMERGENCY SPILLWAY Q (CFS)	EMBANKMENT Q (CFS)	TOTAL Q (CFS)
1587	0	0	0	0
1587.5	7	0	0	7
1588	15	0	0	15
1588.6	19	0	0	19
1589.23	23	7	0	30
1589.85	26	26	0	52
1590.48	28	57	0	85
1591.1	31	106	0	137
1592	34	139	0	173
1592.5	35	154	243	432
1593	37	168	1057	1262
1593.5	39	181	2391	2611

MAXIMUM KNOWN FLOOD AT DAMSITE

NO RECORDS OF WATER LEVELS ARE MAINTAINED FOR THIS DAM. BASED ON RECORDS OF THE USGS STREAM GAGING STATION ON NORTH BRANCH CALKINS CREEK AT NEARBY DAMASCUS, PA. (D.A. = 7.02 SQ. MI.) THE MAXIMUM DISCHARGE OCCURRED IN MARCH 1978 WHEN A FLOW OF 1260 CFS WAS RECORDED. THE MAXIMUM INFLOW TO BEAVER LAKE DAM IS ESTIMATED TO BE:

$$\left(\frac{.32}{7.02}\right)^{0.8} \times 1260$$

$$= 107 \text{ CFS}$$

DESIGN FLOOD

SIZE CLASSIFICATION

MAXIMUM STORAGE = 261 ACRE-FEET
MAXIMUM HEIGHT = 32 FEET
SIZE CLASSIFICATION IS "SMALL"

HAZARD CLASSIFICATION

STATE HIGHWAY CROSSES DOWNSTREAM CHANNEL. FISH COMMISSION LAKE LOCATED ONE MILE DOWNSTREAM. NO HOMES.
USE "SIGNIFICANT"

RECOMMENDED SPILLWAY DESIGN FLOOD

THE ABOVE CLASSIFICATIONS INDICATE USE OF AN SDF EQUAL TO THE 100 YR. FLOOD TO ONE HALF OF THE PROBABLE MAXIMUM FLOOD.

BY RLS DATE 6/16/80 **BERGER ASSOCIATES** SHEET NO. 7 OF
CHKD. BY DATE PROJECT 0965.0
SUBJECT BEAVER LAKE

100 YR FLOOD

REF: "REGIONAL FREQUENCY STUDY UPPER DELAWARE AND HUDSON RIVER BASINS, NEW YORK DISTRICT" U.S. ARMY, CORPS OF ENGINEERS, HEC.

BEAVER LAKE D.A. = 0.32 SQ. MI.

(FIG. 2) $C_m = 1.8$

$$\text{LOG}(Q_m) = C_m + 0.87 \text{ LOG}(A)$$

$$= 1.8 + 0.87 \text{ LOG}(.32)$$

$$= 1.3695$$

(FIG. 3) $C_s = .355$

$$S = C_s - .05 \text{ LOG}(A)$$

$$= .355 - .05 \text{ LOG}(.32)$$

$$= .3797$$

(FIG. 5) SKEW = +.286

(TABLE IV) STANDARD DEVIATE = 2.54

$$\text{LOG}(Q(P)) = \text{LOG}(Q_m) + K(P,g)S$$

$$= 1.3695 + (2.54)(.3797)$$

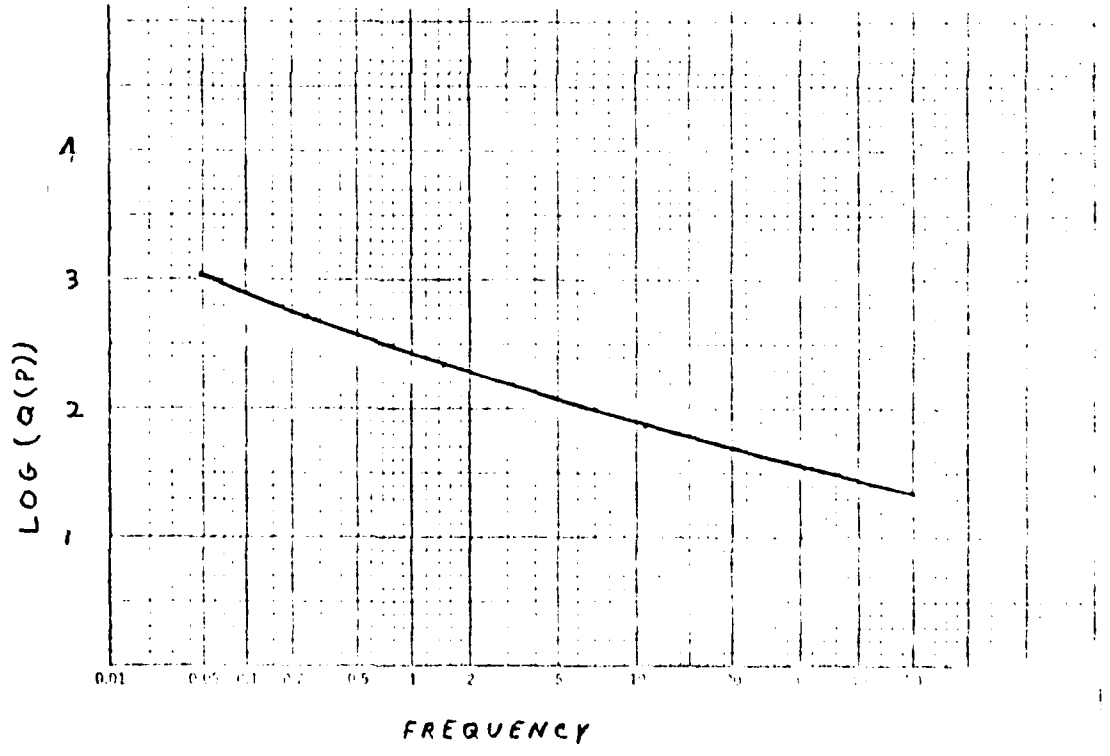
$$= 2.334$$

$Q_1 = 216$ CFS

100 YR FLOOD (CONT)

FOR ASSUMED 30 YR EQUIVALENT RECORD.

FREQUENCY	LOG (Q(P))	PLOT. POSITION
.01	3.02	.049
.1	2.70	.25
1.0	2.334	1.47
5	2.02	5.8
10	1.87	10.8
30	1.56	30.6
50	1.35	50



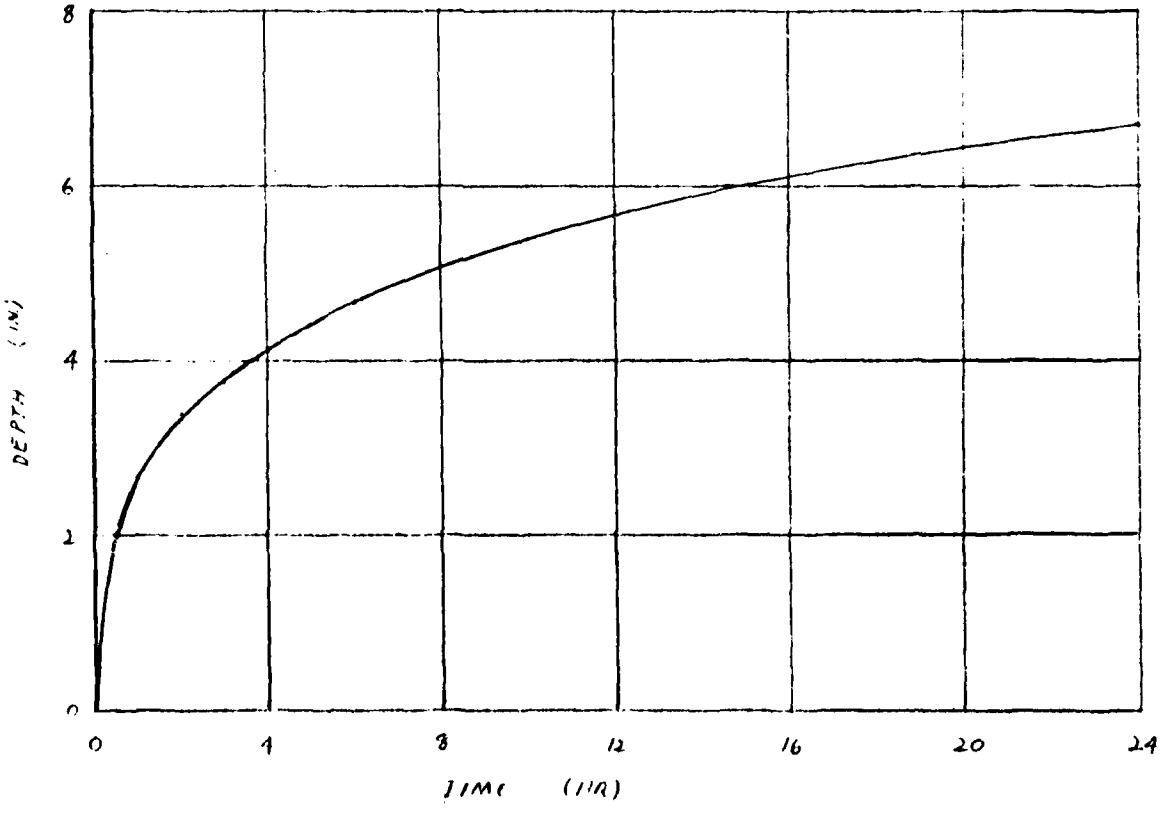
LOG (Q_1) = 2.43 Q_1 = 269 CFS

BY RLS DATE 7/25/80 **BERGER ASSOCIATES** SHEET NO. 9 OF 10
CHKD. BY DATE PROJECT D9650
SUBJECT BEAVER LAKE

100 YR FLOOD (CONT.)

TOTAL RAINFALL (FROM TP-40)

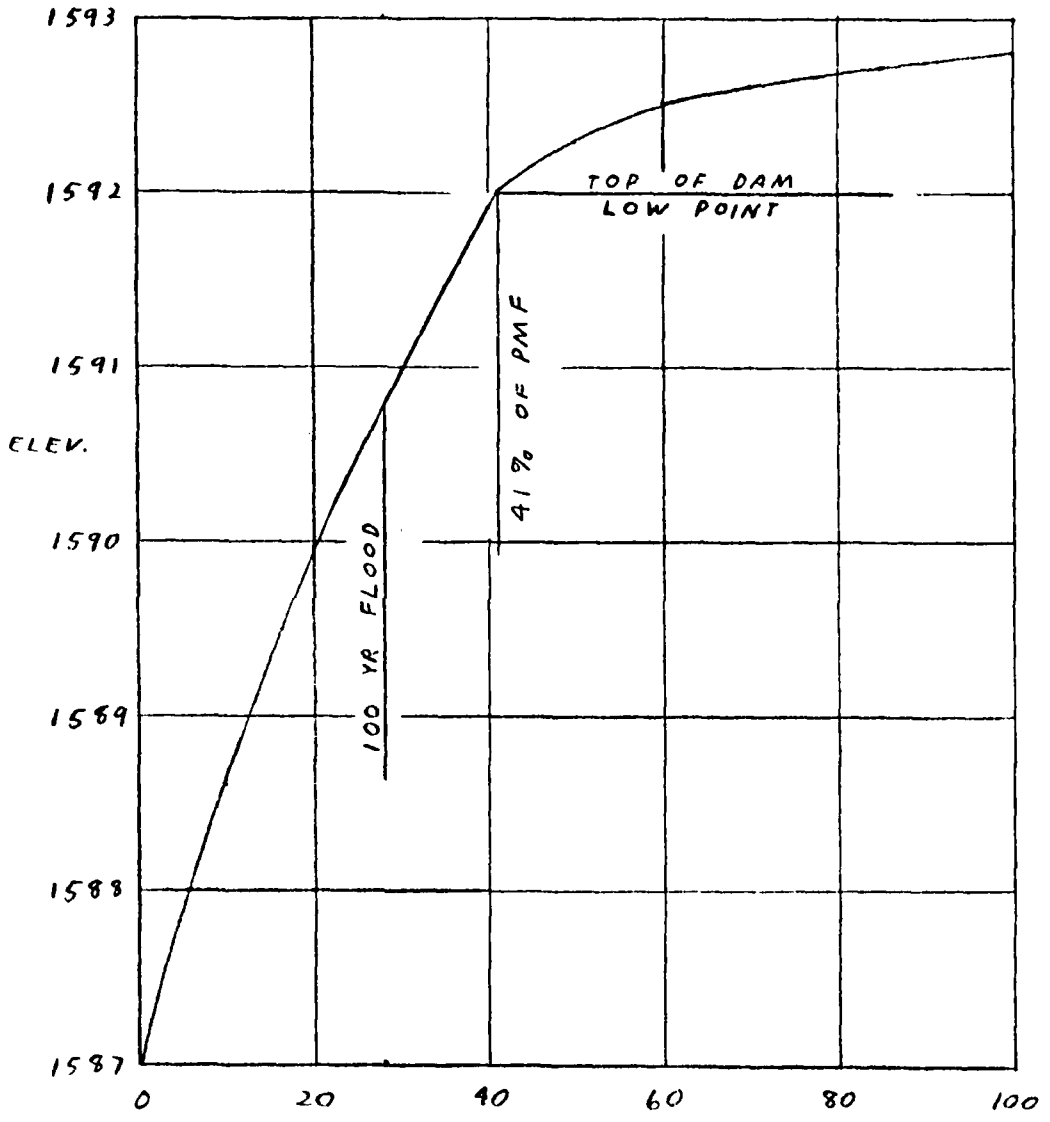
DURATION (HR.)	DEPTH (IN.)
.5	2.1
1	2.65
2	3.1
3	3.75
6	4.65
12	5.65
24	6.7



RUNOFF Q = 277 ≈ 269

BY RLS DATE 6/16/80 **BERGER ASSOCIATES** SHEET NO. 10 OF
CHKD. BY DATE PROJECT D965C
SUBJECT BLAKER LAKE

SPILLWAY CAPACITY CURVE



HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: BEAVER LAKE DAM RIVER BASIN: DELAWARE

PROBABLE MAXIMUM PRECIPITATION (PMP) = 21.0 INCHES/24 HOURS[1]

(FOR FOOTNOTES SEE NEXT PAGE)

STATION		1	2	3	4
STATION DESCRIPTION		BEAVER LAKE	BEAVER LAKE DAM		
DRAINAGE AREA (SQUARE MILES)		.32			
CUMULATIVE DRAINAGE AREA (SQUARE MILE)		.32	.32		
ADJUSTMENT OF PMP FOR DRAINAGE AREA (%)[2]	6 HOURS	111			
	12 HOURS	123			
	24 HOURS	133			
	48 HOURS	142			
	72 HOURS	---			
	Zone 1				
SNYDER HYDROGRAPH PARAMETERS	ZONE[3]	1			
	C_p / C_t[4]	.45/1.23			
	L (MILES)[5]	.78			
	L_{ca} (MILES)[5]	.34			
	$T_p = C_t (L \cdot L_{ca})^{0.3}$ (hours)	.83			
SPILLWAY DATA	CREST LENGTH (FT.)		PRINCIPAL 24" dia.	EMERGENCY 4x30" dia.	
	FREEBOARD (FT.)		5	3.4	
	DISCHARGE COEFFICIENT		0.6	0.6	
	EXPONENT		-	-	
	ELEVATION		1587	1588.6	
AREA[6] (ACRES)	NORMAL POOL (1587)	15.6			
	ELEV. 1600	22			
	ELEV.				
STORAGE (ACRE-FEET)	NORMAL POOL[7] (1587)	177			
	ELEV. 1553[8]	0			
	ELEV.[8]				
	ELEV[8]				

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

(2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

(3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

(4) Snyder's Coefficients.

(5) L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

(6) Planimetered area encompased by contour upstream of dam.

(7) PennDER files.

(8) Computed by conic method.

1**********

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

1	A1	BEAVER LAKE DAM **** UNNAMED TRIBUTARY TO DYBERRY CREEK									
2	A2	LEBANON TWP., WAYNE COUNTY, PA.									
3	A3	NDI # PA-00160 PA DER # 64-100									
4	B	300	0	15	0	0	0	0	0	-4	0
5	B1	5									
6	J	1	1	1							
7	J1	1									
8	K		1					1			
9	K1		INFLOW HYDROGRAPH								
10	M		1	.32							
11	O	96									
12	O1	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
13	O1	.02	.02	.02	.02	.02	.02	.02	.02	.02	.03
14	O1	.03	.03	.03	.03	.03	.03	.03	.04	.04	.04
15	O1	.04	.04	.05	.05	.05	.06	.06	.07	.08	.08
16	O1	.09	.09	.10	.11	.15	.17	.24	.56	1.54	.31
17	O1	.21	.15	.11	.09	.09	.08	.08	.07	.07	.06
18	O1	.06	.05	.05	.05	.04	.04	.04	.04	.04	.03
19	O1	.03	.03	.03	.03	.03	.03	.03	.02	.02	.02
20	O1	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
21	O1	.02	.02	.02	.02	.02	.01				
22	T							1.50	.20		
23	W	.83	.45								
24	X	-1.5	-.05	2							
25	K	1	2					1			
26	K1		RESERVOIR ROUTING								
27	Y				1						
28	Y1	1						177	-1		
29	Y4	1587	1587.5	1588	1588.6	1587.23	1589.85	1590.48	1591.1	1592	1592.5
30	Y4	1593	1593.5								
31	Y5	0	7	15	19	30	52	85	137	173	432
32	Y5	1262	2611								
33	$A	0	15.6	22							
34	$E	1583	1587	1600							
35	$$	1587									
36	$D	1592									
37	K	99									

1 PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT 1
ROUTE HYDROGRAPH TO 2
END OF NETWORK

1**********

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 80/07/28.
TIME= 11.44.22.

BEAVER LAKE DAM **** UNNAMED TRIBUTARY TO DYBERRY CREEK
LEBANON TWP., WAYNE COUNTY, PA.
NDI # PA-00160 PA DER # 64-18

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	.32	0.00	.32	0.00	0.000	0	0	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.20	0.00	0.00

UNIT HYDROGRAPH DATA
TP= .83 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 30 END-OF-PERIOD ORDINATES, LAG= .84 HOURS, CP= .45 VOL= 1.00

15.	56.	96.	108.	95.	78.	65.	54.	45.	37.
31.	25.	21.	17.	14.	12.	10.	8.	7.	6.
5.	4.	3.	3.	2.	2.	1.	1.	1.	1.

END-OF-PERIOD FLOW

NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	6.70	3.30	3.41	2843.
										(170.)(	84.)(	86.)(	80.50)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

RESERVOIR ROUTING

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

RESERVOIR ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	177.	-1

STAGE	1587.00	1587.50	1588.00	1588.60	1589.23	1589.85	1590.48	1591.10	1592.00	1592.50
	1593.00	1593.50								
FLOW	0.00	7.00	15.00	19.00	30.00	52.00	85.00	137.00	173.00	432.00
	1262.00	2611.00								
SURFACE AREA=	0.	16.	22.							
CAPACITY=	0.	177.	420.							
ELEVATION=	1553.	1587.	1600.							

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1587.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1592.0	0.0	0.0	0.

PEAK OUTFLOW IS 44. AT TIME 16.00 HOURS

********** ********** ********** ********** **********

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO APPLIED TO FLOWS 1
				1.00
HYDROGRAPH AT	1	.32	1	277.
	(	.83)	(	7.84)(
ROUTED TO	2	.32	1	44.
	(	.83)	(	1.25)(

1 SUMMARY OF DAM SAFETY ANALYSIS

********** ********** ********** ********** **********

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00
HYDROGRAPH AT	1	.32	1	277.
	(	.83)	(	7.84)(
ROUTED TO	2	.32	1	44.
	(	.83)	(	1.25)(

1 SUMMARY OF DAM SAFETY ANALYSIS

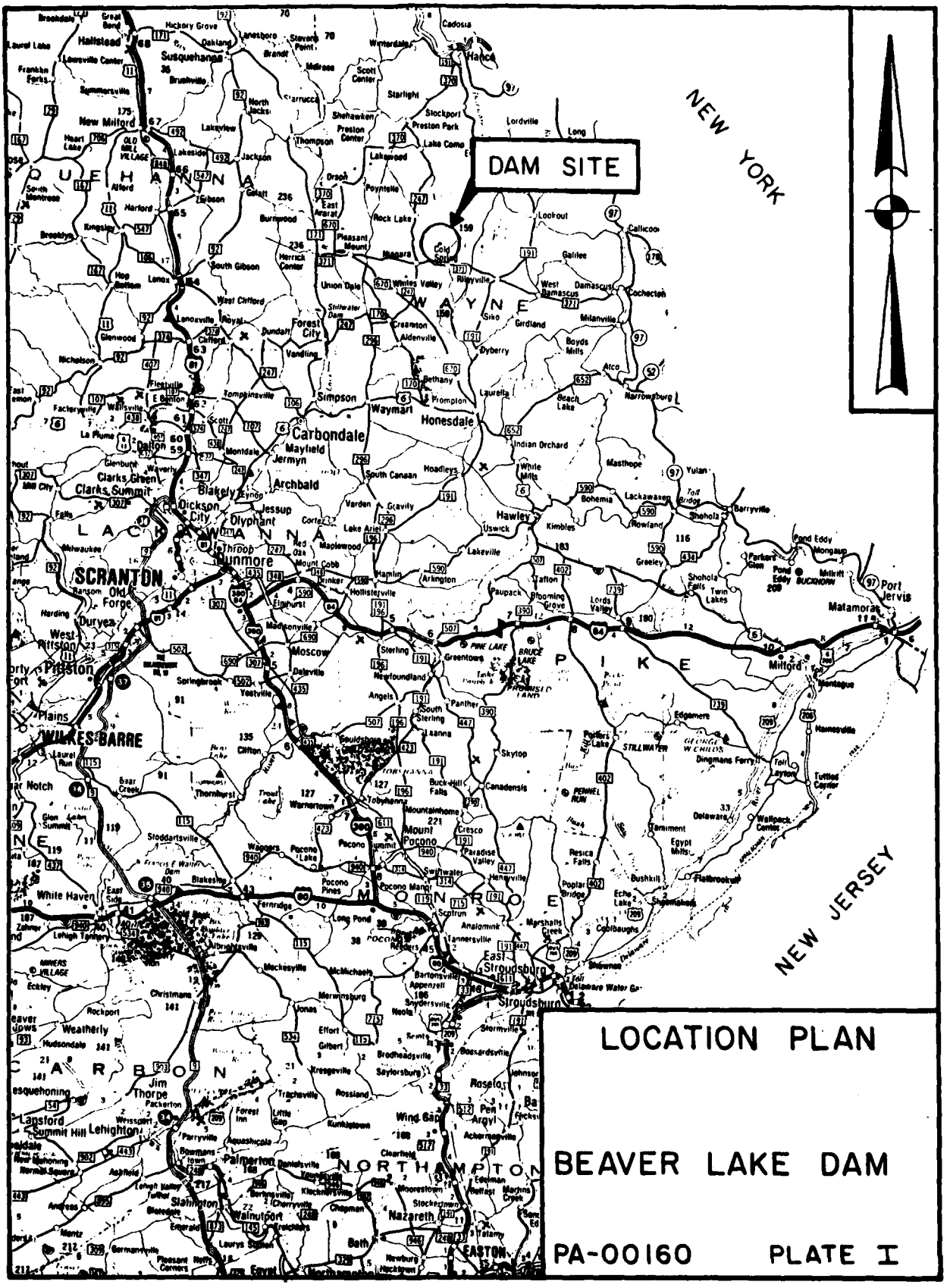
PLAN 1		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	1587.01	1587.00	1592.00
	STORAGE	177.	177.	261.
	OUTFLOW	0.	0.	173.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1589.63	0.00	219.	44.	0.00	16.00	0.00

EOI ENCOUNTERED.
N>

APPENDIX E

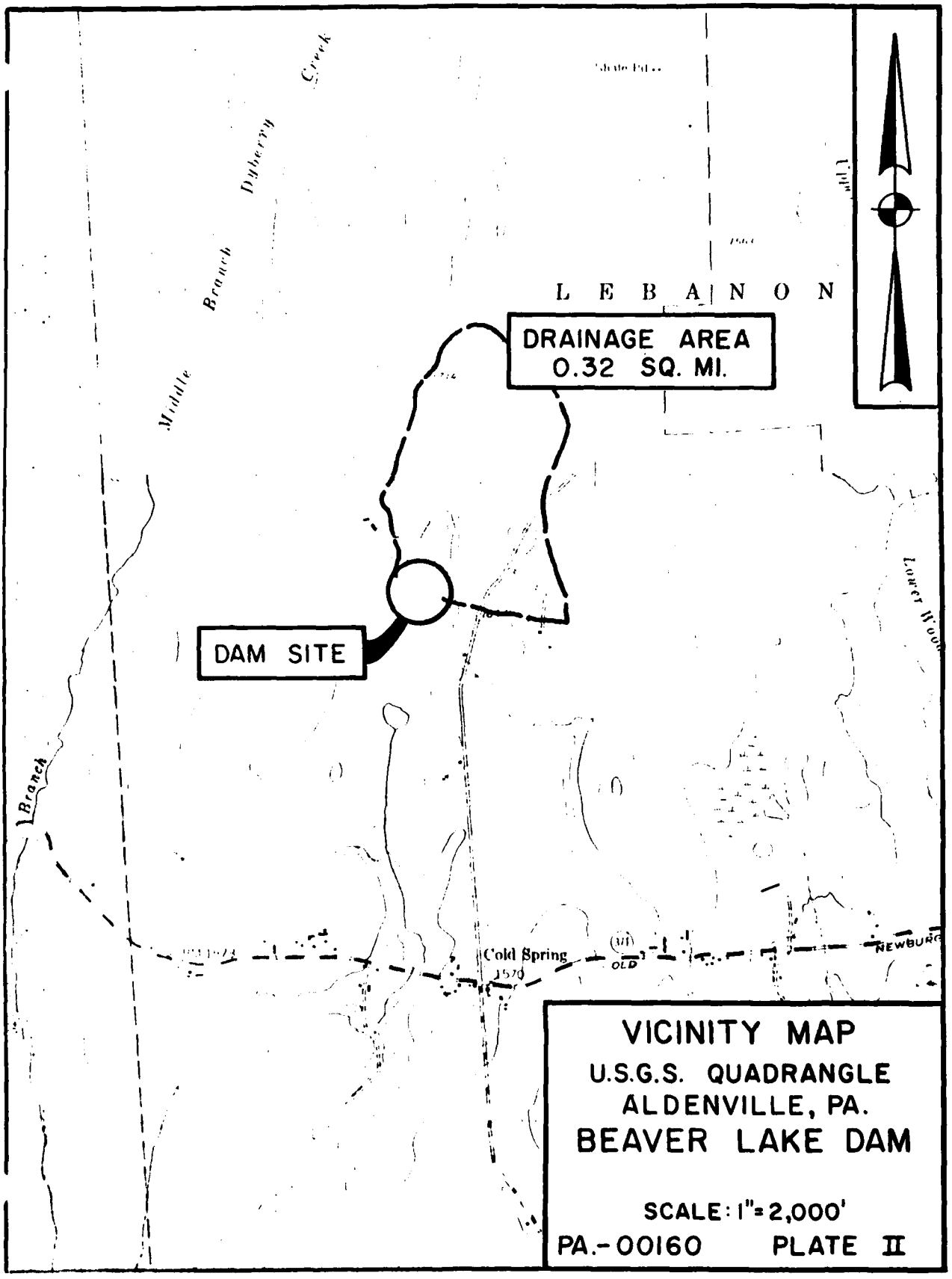
PLATES



LOCATION PLAN

BEAVER LAKE DAM

PA-00160 PLATE I



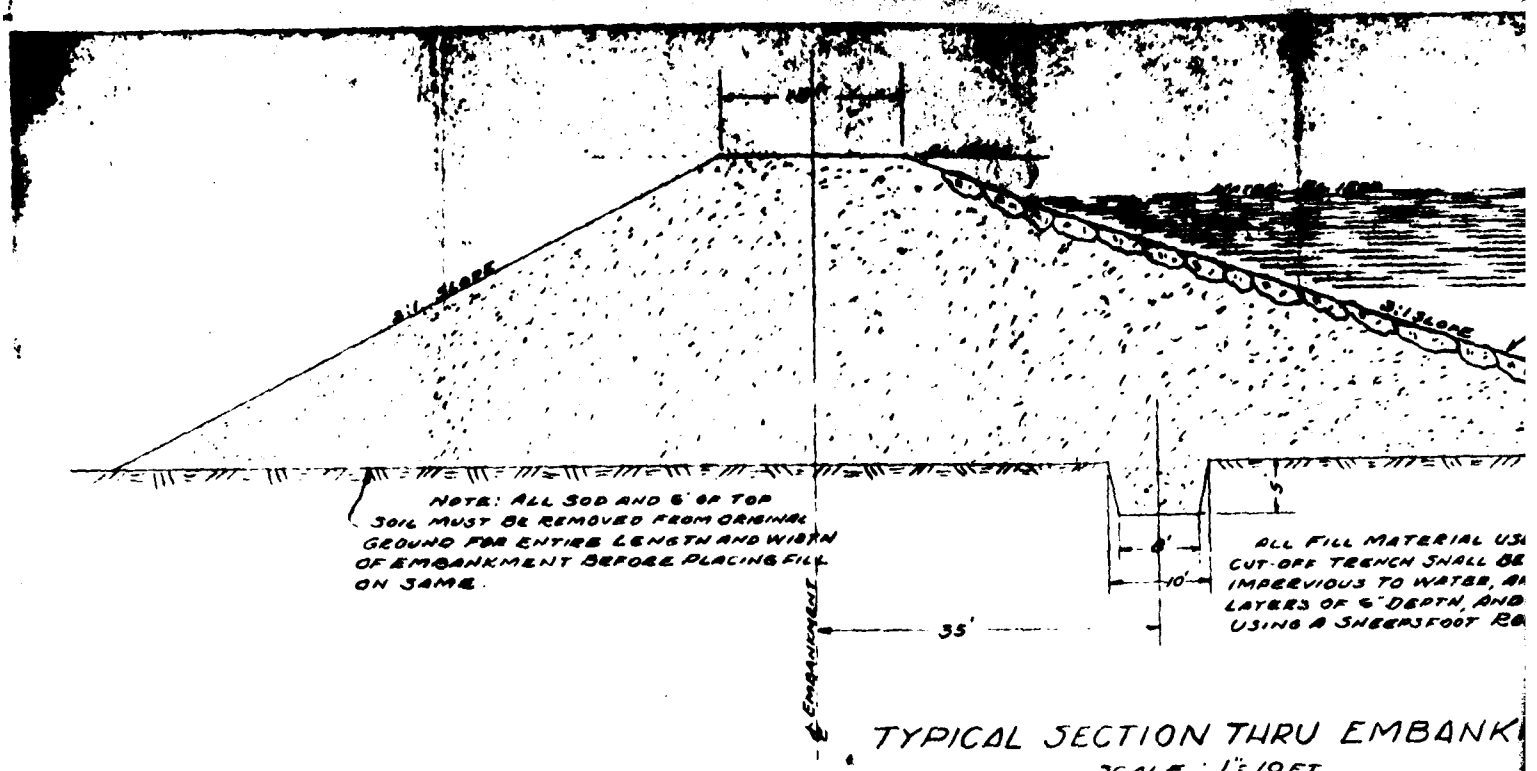
VICINITY MAP

U.S.G.S. QUADRANGLE
ALDENVILLE, PA.

BEAVER LAKE DAM

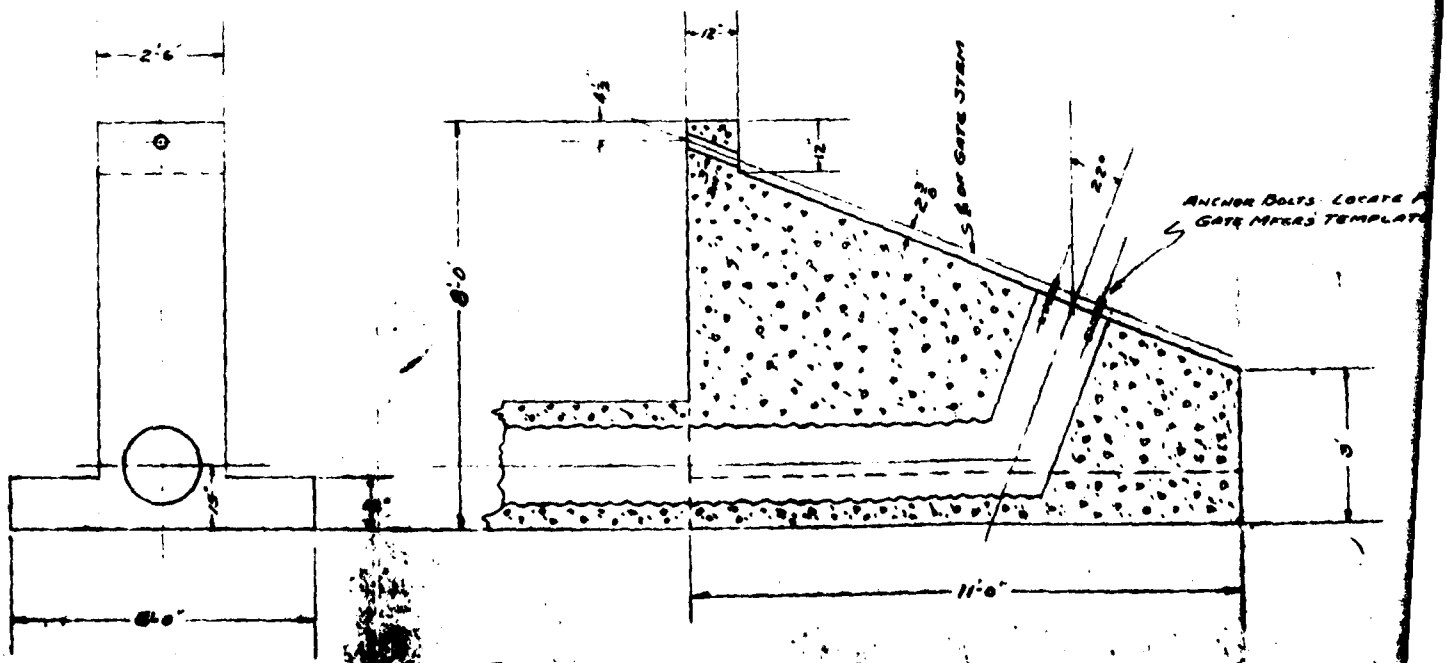
SCALE: 1"= 2,000'

PA.-00160 PLATE II



TYPICAL SECTION THRU EMBANK

SCALE: 1" = 10 FT



DETAILS

DROP INLET

SCALE: 1" = 1'-0"

64-180-4

FILE NUMBER

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS & WATERS ON THE 7 DAY OF May A.D. 1962

Chester A. Degenhart
File Clerk

REC'D _____ FOR _____

SEE REPORT NO. _____

_____
Div. Dams

UPSTREAM SLOPE OF EMBANKMENT SHALL BE RIP-RAPPED USING ONE MAN STONE - HAND PLACED. VOIDS BETWEEN STONES SHALL BE FILLED WITH CRACKED STONE.

RIAL USED IN EMBANKMENT AND
HALL BE OF CLAY-SAND MIXTURE,
ATER, AND SHALL BE PLACED IN
TH, AND THOROUGHLY COMPACTED,
OOT ROLLER

ANKMENT

LOCATION OF PROPOSED POND - ONLY INLET STREAM IS FROM SPRING AT NORTH END OF POND

MOUNT PLEASANT TSHP

LEBANON TSHP.

TOPOGRAPHIC AND LOCATION MAP OF C. HOPPL'S LAND

— SCALE —
CONTOUR INTERVAL 20 FT

MISC DETAILS
PROPOSED FARM POND
PROPERTY OF
CARL HOPPL, LEBANON TSHP
WAYNE COUNTY
L.F. BURLEIN, R.P.E.

SHEET No. 4 of 6

2

64-180-4

FILE NUMBER

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS & WATERS ON THE 7 DAY OF July A.D. 1962

Clifton D. Ehrenhart
File Clerk

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_____ Div. Dams

FROM SOUTH AT NORTH END OF POND

EAST

MINUM COPY FURNISHED TO BDC

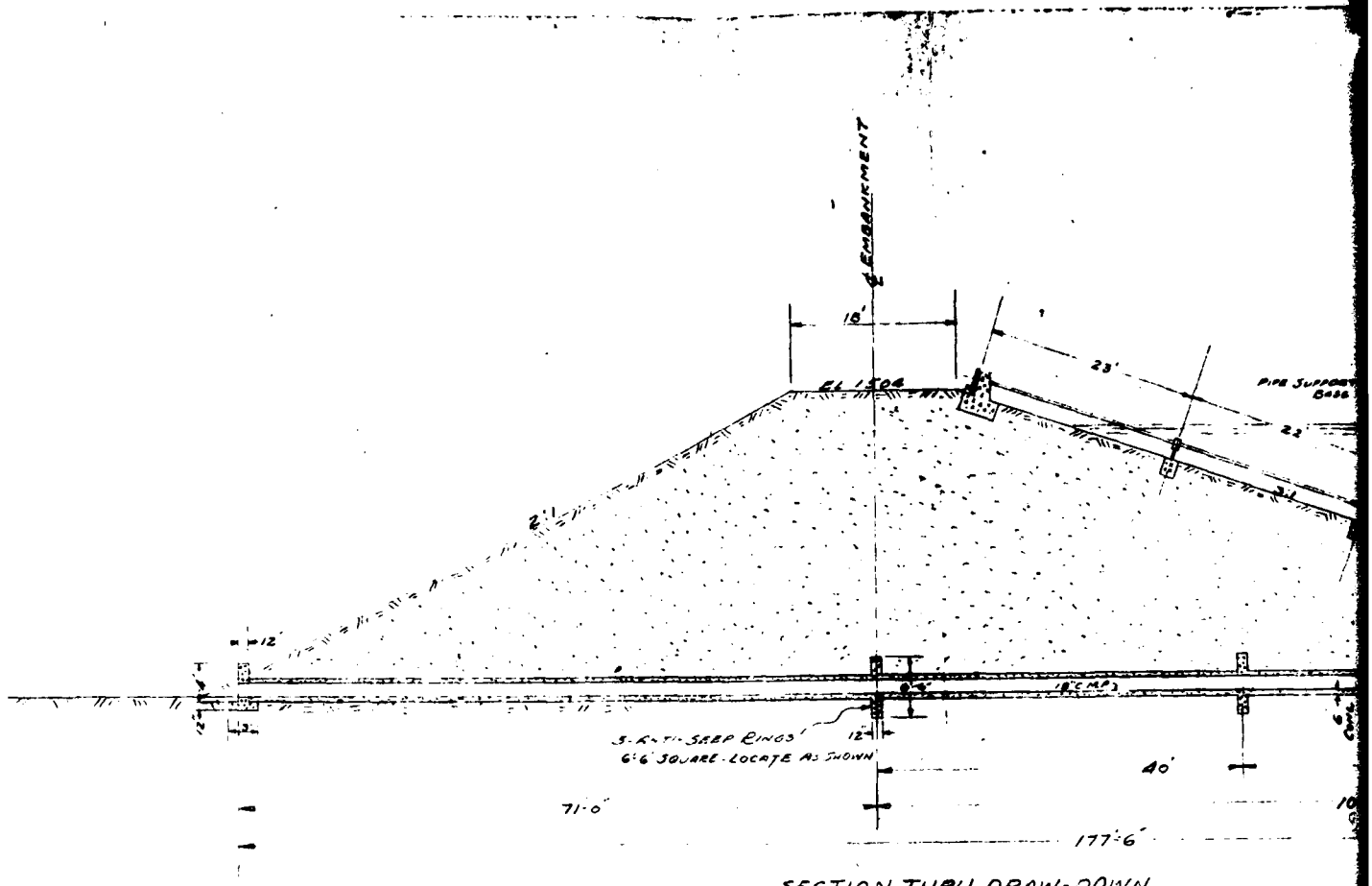
— SCALE —

CONTOUR INTERVAL 20FT

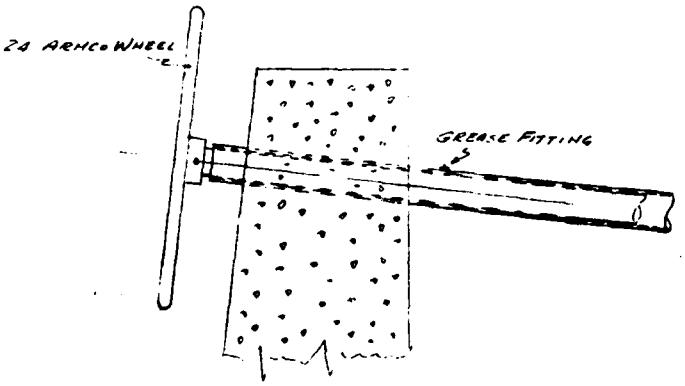
MISC DETAILS
PROPOSED FARM POND
PROPERTY OF
CARL HODDL, LEBANON TSNP
WAYNE COUNTY
L.F. BURLEIN, R.P.E.
SHEET No. 4 OF 6

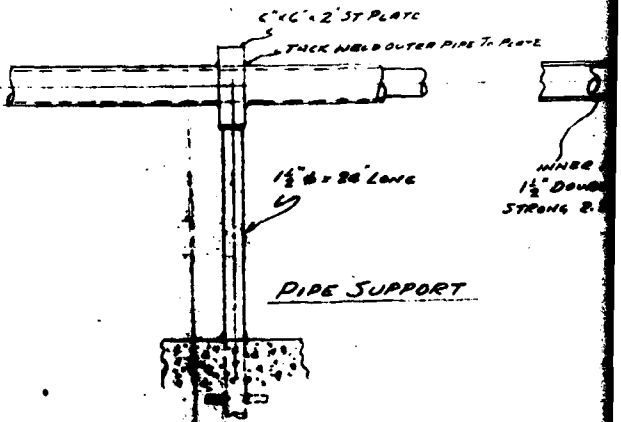
3

PA-00160
PLATE III



SECTION THRU DRAW-DOWN
SCALE:- $\frac{3}{32}$" = 1'-0"





DRAW DOWN GATE DETAILS
SCALE: $\frac{3}{32}$" = 1'-0"

64-180-3
FILE NUMBER

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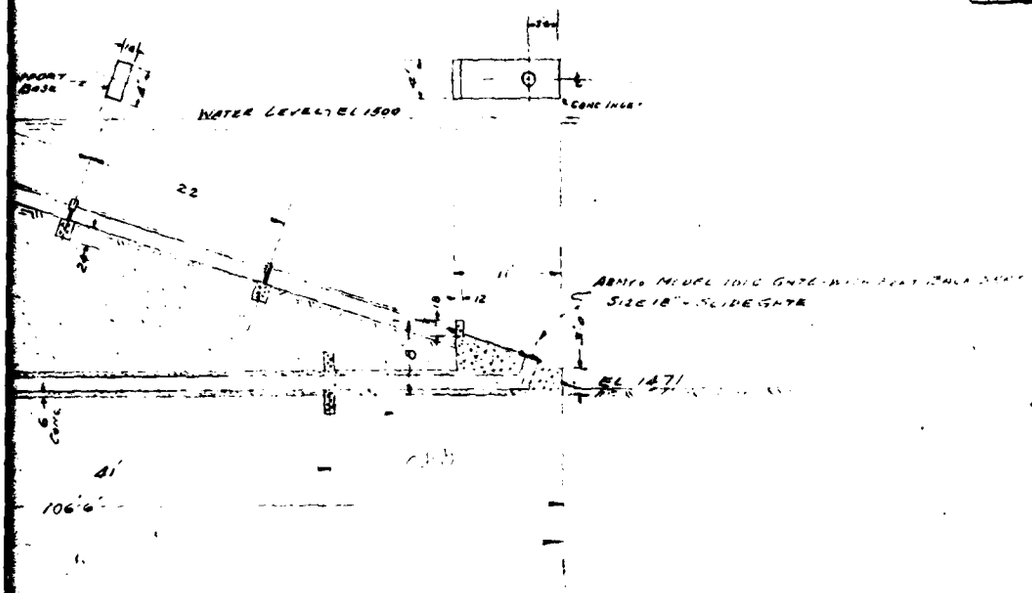
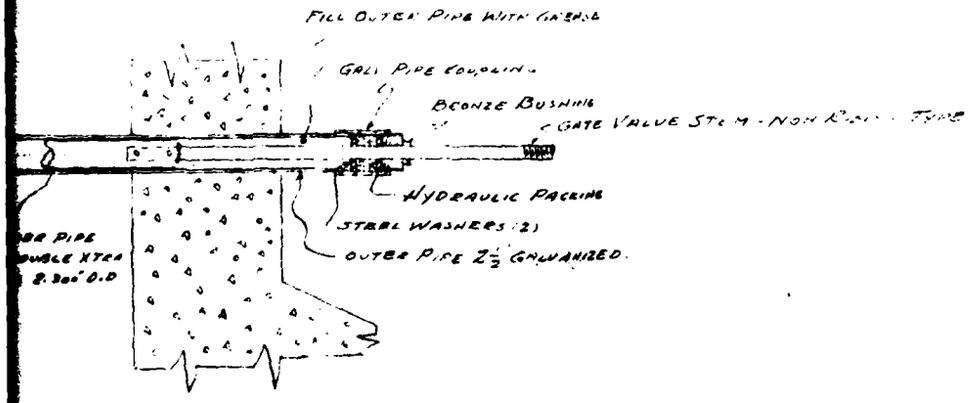
File Clerk

RECD [illegible] FOR

SEE REPORT DATED [illegible]

Div. Dams





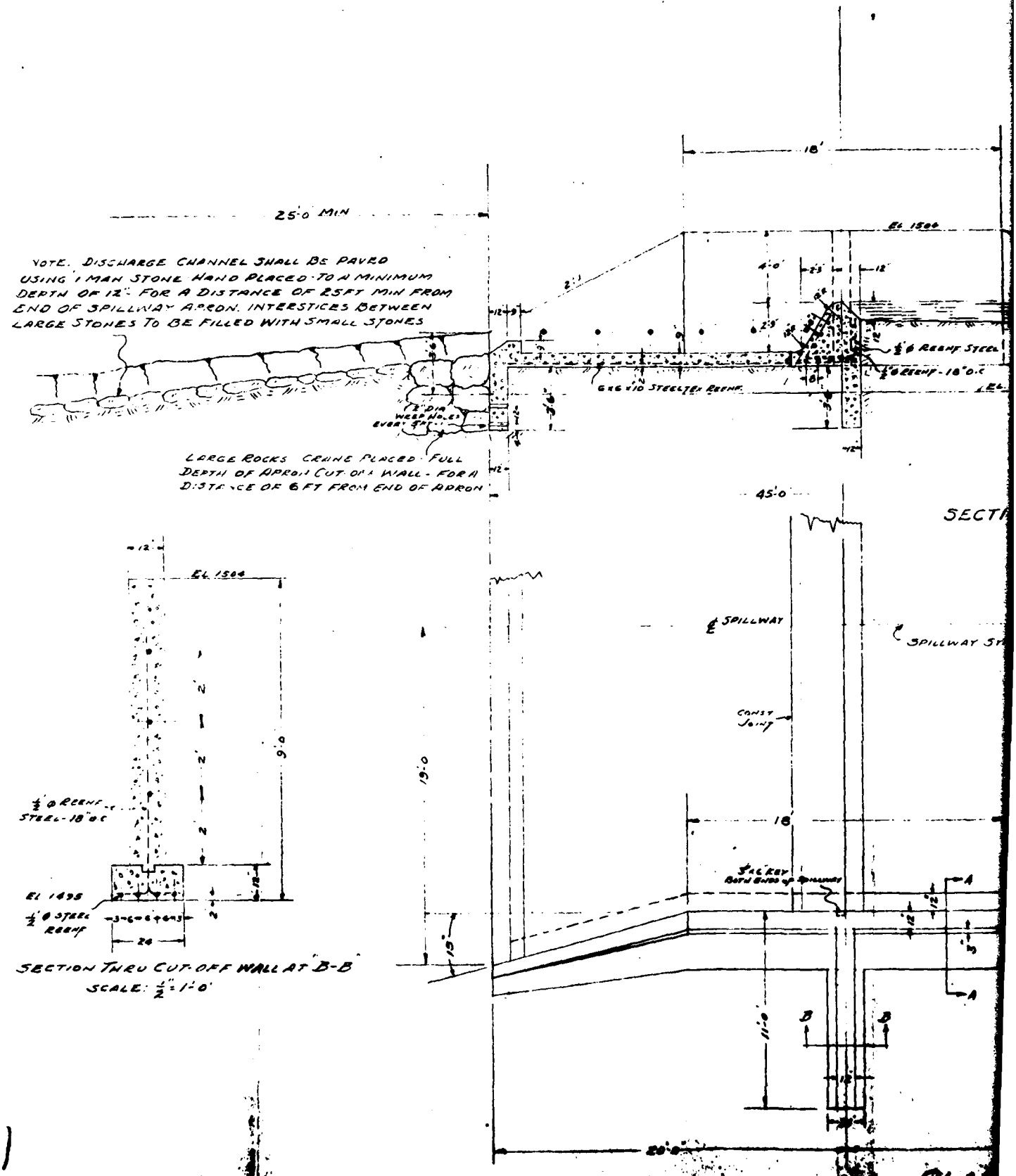
DETAILS - DRAW DOWN
PROPOSED FARM POND
CARL HOPPL OWNER
LEBANON TOWNSHIP
MARCH 1962
L.F. BURLEIN, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
LESTER F. BURLEIN
ENGINEER
No. 6393

SHEET No 3 OF 6

2

PA-00160
PLATE IV


18'
25'-0 MIN
EL 1500
NOTE. DISCHARGE CHANNEL SHALL BE PAVED USING 1 MAN STONE HAND PLACED TO A MINIMUM DEPTH OF 12" FOR A DISTANCE OF 25FT MIN FROM END OF SPILLWAY APRON. INTERSTICES BETWEEN LARGE STONES TO BE FILLED WITH SMALL STONES
4'-0
2'-3
12"
½" ø REINF. STEEL
½" ø REINF - 18" O.C
6x6 x10 STEEL FLEX REINF.
12" DIA WEEP HOLES EVERY 4TH
LARGE ROCKS CRUSHED PLACED FULL DEPTH OF APRON CUT OFF WALL FOR A DISTANCE OF 6 FT FROM END OF APRON
45'-0
SECTION
EL 1504
9'-0
½" ø REINF. STEEL - 18" O.C
EL 1495
½" ø STEEL REINF
3-6 @ 6 = 18
24
SECTION THRU CUT-OFF WALL AT 'B-B'
SCALE: ½" = 1'-0"
℄ SPILLWAY
℄ SPILLWAY ST
CONST JOINT
19'-0
18'
3" AC KEY BOTH SIDES OF SPILLWAY
A
A
B
B
11'-0
20'-0
PLA

64-180=10
FILE NUMBER

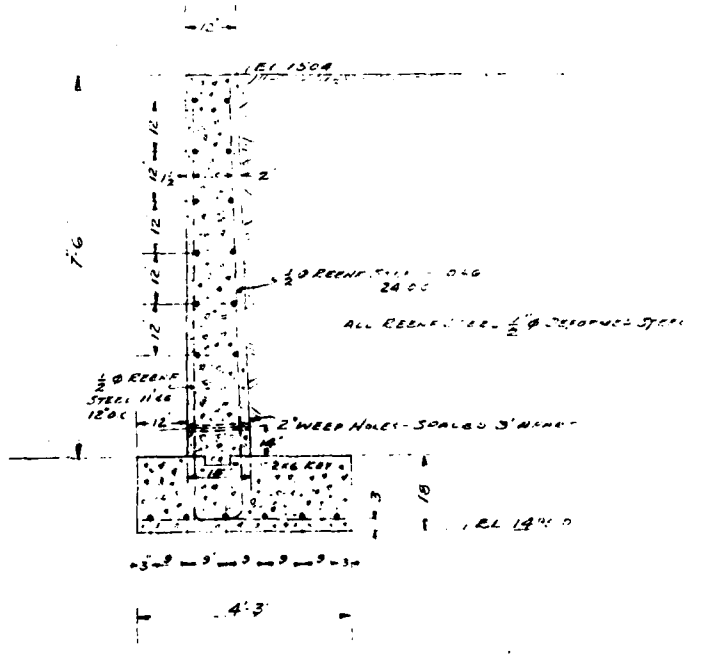
RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS & WATERS ON THE 22 DAY OF May A.D. 1962
Austin H. Dapper
File Clerk

REC'D _____ FOR _____
SEE REPORT NO. _____
Div. Dams

HRU SPILLWAY
"=1'-0"

L ABOUT ℄

PILLWAY
'-0"



SECTION THRU ABUTMENT AT A-N
SCALE: 1/2"=1'-0"

SPILLWAY DETAILS

PROPOSED FARM POND FOR CARL HOPPL, OWNER - LEBANON TOWNSHIP
MARCH 1962 SCALE: AS SHOWN
L.F. BURLEIN, REG ENGR

SHEET No 2 OF 6

REV. 5-18-62

PA-C
PLA

APPENDIX F

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam and Reservoir

Formation Name: Catskill Formation, undifferentiated.

Lithology: The Catskill Formation consists of red shale interbedded with gray, cross-bedded sandstone, with some conglomerate, some red sandstone and gray to olive green shale.

Structure

The dam is located in the Pocono Plateau and the beds are essentially flat lying.

Air photo fracture traces trend: N15°E and N35°W.

Overburden

The site is within the limits of Pleistocene glaciation and variable thicknesses of glacial till and outwash sediments are present in the area. Plans for the dam indicate that several borings or test pits were made along the centerline of the dam. All were about six feet deep and encountered: loam, one to two feet thick; sand and gravel, two to three feet thick; and clay, two to three feet thick. No bedrock was encountered.

Aquifer Characteristics

The rocks of the Catskill Formation are essentially impermeable and ground water movement is entirely along bedding planes and fractures. The most permeable aquifers in the area are the sands and gravel of the glacial outwash commonly found in the valleys.

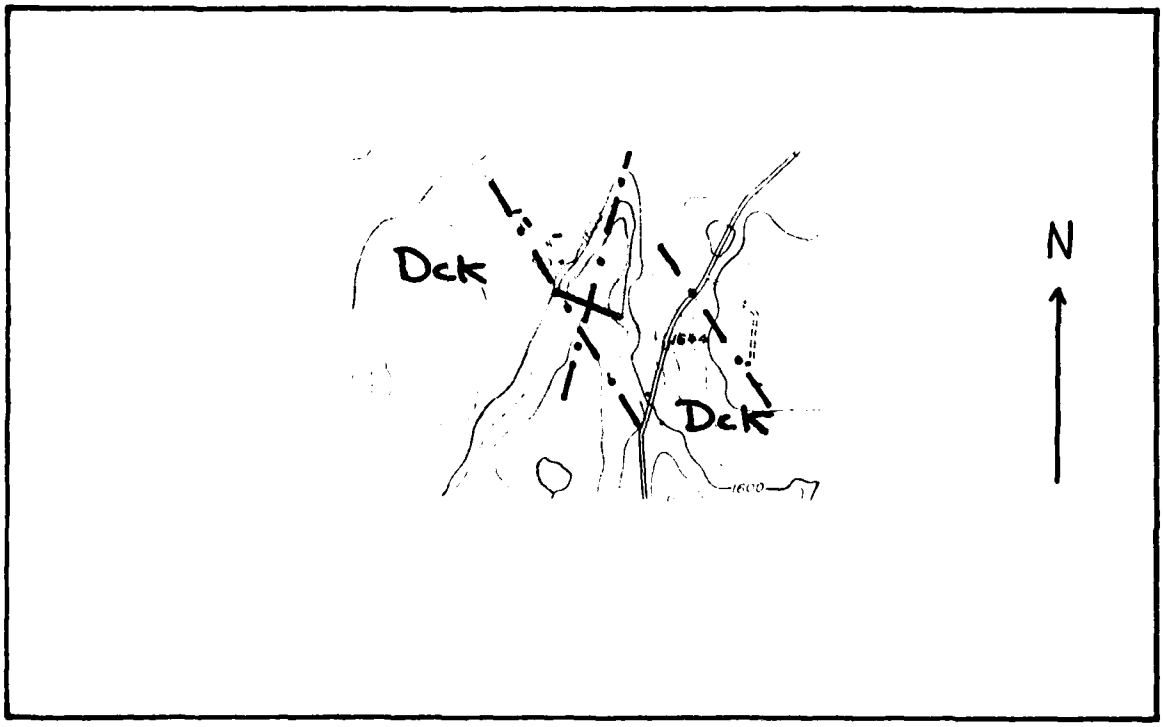
Discussion

The plans show that a cutoff trench five feet deep was dug. This should be deep enough to be in the underlying clay everywhere. The foundation materials of the dam appear to be adequate.

Sources of Information

1. Manuscript Geologic Map of the Aldenville Formation in open file at the Pa. Geologic Survey, Harrisburg, Pa.
2. Air Photographs, dated 1969. Scale 1:24,000.
3. Plans and reports in file.

GEOLOGIC MAP - BEAVER LAKE DAM



Dck — Catskill Fm.- undifferehtiated

—·—·— air photo fracture trace

SCALE 1:24000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET


FIL
2